I. C. 6309 May, 1930

DEPARTMENT OF COMMERCE

UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

INFORMATION CIRCULAR

GEOPHYSICAL ABSTRACTS

NO. XIII.

BY

F. W. LEE

I. C. 6309
May, 1930

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE — BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 13

Compiled by Frederick W. Lee[2]

TABLE OF CONTENTS

Page
1. Gravitational methods 2
2. Magnetic methods 6
3. Seismic methods 8
4. Electrical methods 13
5. Radioactive methods 15
6. Geothermal methods 15
7. Unclassified methods 17
8. Geology . . . .
9. New books 23

List of contributing editors of Geophysical Abstracts:
Ayvazoglou, W.,U.S. Bureau of Mines, Department of Commerce, Washington, D. C.
Barton, Dr. D.C., Petroleum Building, Houston, Tex.
Bogoiavlensky, Prof.L.,Central Chamber of Weights and Measures, Leningrad, U.S.S.R.
Eve, Dr. A. S., Micgill University, Montreal, Canada.
Foote, Dr. Paul D., Mellon Institute, Pittsburgh, Pa.
Gish, Dr. O. H., Carnegie Institution, Broad Branch Road, Washington, D. C.
Gorsky, Eng. V., Allatini Mines, Ltd., Skoplie.B.p. 134, Yugoslavia.
Hartley, Kenneth, Humble Oil Co., Houston, Tex.
Hutchinson, Prof. W. Spencer, Mass. Institute of Technology, Cambridge, Mass.
Jenny, Dr. W. P., 210 McGowen Avenue, Houston, Tex.
Karcher, Dr. J. C., Geophysical Research Corp., 65 Broadway, New York City.
Keys, Dr. D. A., McGill University, Montreal, Canada.
Knappen, Dr. R. S., Gypsy Oil Co., Tulsa, Okla.
Korzujin, Prof.J., National University of Mexico, Mexico, D.F.
Lane, Prof. Alfred C., Tufts College, Boston, Mass.
Lee, Dr. F.W., U.S. Bureau of Mines, Department of Commerce, Washington, D.C.
Leonardon, E.C., 25 Broadway, New York City.
Numerov, Prof. Dr. B.V., Fontanka 34, Leningrad, U.S.S.R.
Petrowsky, A., Wasilly Ostrov, 21 Linia No. 8-A, Leningrad, U.S.S.R.
Roman, Dr. I., Geophysical Research Corporation, 65 Broadway, New York City.
Ruark, Dr. A. E., Mellon Institute, Pittsburgh, Pa.
Scholl, Louis A., Box 1805, Houston, Tex.
Shaw, Dr. H., The Science Museum, South Kensington, London, S.W.7.
Sundberg, Dr. Karl, Swedish American Prospecting Corp., 26 Beaver St., New York City.
Truemann, O.H., Humble Oil Co., Houston, Tex.
Van Orstrand, Dr.C.E., Interior Building, Washington, D. C.
Weaver, Paul, Drawer C, Houston, Tex.
Weelden, Dr. A. von, Shell Petroleum Corporation, Dallas, Tex.
Wright, Dr. F. E., Carnegie Institution, Washington, D. C.
Zuschlag, Dr. Theodor, Swedish American Prospecting Corp., 26 Beaver St.,New York.N.Y

---

[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U.S. Bureau of Mines information circular 6309.

[2] Senior Physicist, U. S. Bureau of Mines.

1. GRAVITATIONAL METHODS

EIN NEUER VIERPENDELAPPARAT FUER RELATIVE SCHWEREMESSUNGEN
(A NEW FOUR-PENDULUM APPARATUS FOR RELATIVE GRAVITY MEASUREMENTS)

By. O. Meissner

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 1-12.

A new four-pendulum apparatus with fundamental improvements is described. In order to create an instrument answering the demands for increased accuracy of observation and of value for work in the field, thorough consideration was given to all developments in the theory of pendulums, the results of researches on materials, and present possibilities for application of physical methods of measurement. Photographs of the apparatus and a series of diagrams illustrate the article.—Author's abstract, translated by W. Ayvazoglou.

GEOPHYSIKALISCHE MESSUNGEN UNTER TAGE
(UNDERGROUND GEOPHYSICAL MEASUREMENTS)

By O. Meissner and F. Wolf

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 13-21.

The authors discuss the possibility of applying geophysical methods to the problems of mining. General rules for making torsion-balance measurements in mines are given. Vectors for a special case are calculated theoritically and the vectors are drawn.

In order to make the Hecker's torsion balance suitable for measurements in mines, the constants of this instrument were changed as follows: The total length of the beam of the balance was made 21 centimeters; the weight, 21 grams; the difference between the heights of the weights, 36 centimeters; the torsion constant, 0.32; and the length of the filament, (W), 31 centimeters. The instrument was mounted on an adjustable foot allowing the center of gravity of the balance to be changed by 1 millimeter. The accuracy of measurement of the gradient was ± 2.5 E; this is considered sufficient for underground measurements.

Theoretical curves, shown in diagrams, have proved to be useful in practice, and the small torsion balance gave sufficiently good results, within the admissible limits of errors equal to ± 3 E.

The last part of the article gives the results of torsion-balance measurements carried out in a salt mine.

In order to complete the problems the authors find it necessary to use some other geophysical methods (magnetic, seismic), in addition to the torsion balance measurements. — W. Ayvazoglou.

BESTIMMUNG DER TEMPERATUR - UND DER LUFTDICHTEN-KONSTANTEN VON SCHWERKRAFTPENDELN NACH DEM ZWEIPENDELVERFAHREN

(DETERMINATION OF TEMPERATURE CONSTANTS AND AIR-DENSITY CONSTANTS OF GRAVITY PENDULUMS BY THE TWO-PENDULUM METHOD)

By H. Schmehl and W. Jenne

Zeitschrift fuer Instrumentenkunde, vol. 49, No. 8, 1929, pp. 396-406.

The authors discuss the two-pendulum emthod of observation and reduction, as this method differs in many points from that generally used. The apparatus is described, the procedure of observations explained, and the conditions are mentioned under which the observations are carried out; the results of observations are given in tables, and the proceedings for reduction and adjustment of observations necessary for determination of temperature constants and air-density constants are considered. The authors show that the determination of the temperature constants and density constants of gravity pendulums by the two-pendulum method, if compared with the usual one-pendulum method, offers the following advantages:

1. The time of observation is reduced one-half.
2. The accuracy of the determination of the constants is increased.
3. The reduction work is simplified.

The correction of observations according to the coincidence moments instead of periods of oscillations is another important advantage. -- W. Ayvazoglou.

SUBTERRANEAN STRUCTURE OF THE TAKAMACHI OIL-FIELD REVEALED BY GRAVITATIONAL METHOD

By Motonori Matsuyama and Hideo Higashinaka

Japaneso Journal of Astronomy and Geophysics, vol. 7, No. 2, 1930, pp. 47-81.

The authors describe the results of observations carried out with the Eötvös gravity-variometer in the autumn of 1927 in the oil district of Takamachi anddiscuss the subterranean structure as revealed by the observations. Contents of the article:

1. Introduction.
2. Method of observations.
3. Values of the Eötvös quantities.
    - (a) The observed data.
    - (b) Corrections for topography.
    - (c) The normal effects.
    - (d) The residual effects.

4. Underground disturbances and anomalies of gravity.

   (a) Existence of a fault and its depth.

   (b) Some suggestions.

   (c) Anomalies of gravity.

   (d) Conclusion.

In all, measurements on 21 stations were made; tables are given showing the observed data, topographical effects, and residual effects at these stations.

In the appendix the authors describe the effect of a mass of two-dimensional form upon Eötvös quantities and discuss the possibility of determining the subterranean configuration according to that effect. General formulas are given for faults and dykes derived from simple forms such as: Rectangular prism, triangul prism, quadrangular prism, prism of any form, and cylindrical form. Eighteen figures illustrate the article. — W. Ayvazoglou.

GRUNDSÄTZLICHE FRAGEN BEI DER BERECHNUNG DER SCHWERKRAFT (FUNDAMENTAL QUESTIONS IN COMPUTING THE FORCE OF GRAVITY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 85-94.

Geophysics often deal with the problem of computing the gravity acceleration inside of the earth's crust for a point situated near the surface of the earth. Therefore, computation of the force of gravity is a problem which concerns interior space. But as a rule the problem is solved in such a way that the earth's crust is assumed to be a mass formation reduced to a plane, in the exterior space of which the point under investigation is situated; that is, the problem becomes that of the exterior space.

In this article Hopfner examines the question: on what supposition does the method of condensation by computing attraction of masses lead to approximations which may be used for comparison with circumstances offered in nature?

The results of a test investigation brought the author to the conclusion that the condensation of attracting masses is a problem which concerns interior space and therefore can not be solved as a problem of exterior space. — W.Ayvazoglo

SUL PROBLEMA DELLE ISOGAMME (ON THE PROBLEM OF ISOGAMS)

By Arnaldo Belluigi

Reprint from the Gerlands Beitrage zur Geophysik, vol. 20, No. 3/4, 1928, 2 pp.

This article is written in connection with a previous work of the author, "Su l'impiego delle isogamme" (on the use of isogams), published in the "Reale Istituto Lombardo di Scienze e Lettere," vol. 61, No. 6-10, 1928. Belluigi shows here how some limitations of the use of isogams may be eliminated, thus making it possible to solve the problem of isogams for a very general case in a quick and accurate way.— W. Ayvazoglou.

LA CORREZIONE TOPOGRAFICA NEI RELIEVI GRAIMETRICI (GRAVIMETRICAL PROCEEDINGS FOR TOPOGRAPHIC CORRECTIONS)

By A. Belluigi

R. Ufficio Centrale di Meteorologia e Geofisica, Roma, vol. 2, series 3, 1929, 18 pp.

In one of his previous articles, "Semplici e rapidi procidimenti di correzione topografica" (Simple and rapid proceeding for topographic corrections), published in the R. Accademia Nazional dei Lincei, vol. 9, No. 8, 1929, Belluigi derived simple formulas and indicated gravimetrical proceedings for topographic correction, by which the results obtained were not inferior to those attained by old proceedings, in particular those derived by Eötvös and Schweydar. In this article the author discusses new formulas and considerations and gives graphs and tables. —W. Ayvazoglou.

ÜBER DEN SCHWEREUNTERSCHIED MUNCHEN-POTSDAM (ON THE MUNICH-POTSDAM GRAVITY DIFFERENCE)

By Karl Schütto

Sitzungsberichte der Bayerischen Akademie der Wissenschaften, vol. 1, Jan. - March, 1929, pp. 85-95.

Taking into consideration the importance of the determination of the relative gravity difference between Munich and Potsdam, owing to the fact that the observatory in Munich serves as a reference station for pendulum observations made in Bavaria, new observations were carried out from April 25 to June 25, 1928, for comparison with the old, already existing, data.

In this article Schütte examines and compares briefly the results of observations. The article is divided under the following headings: (1) Introduction; (2) Pendulums and their constants; (3) Observations made in 1928; (4) On the constants of the pendulums; and (5) The relative gravity difference, Munich-Potsdam. —W. Ayvazoglou.

GRAVIMETRIC METHOD BASED ON USE OF TORSION BALANCE

By. H. W. Rose

The Oil and Gas Journal, vol. 28, No. 45, 1930, pp. 41 and 112.

Rose gives general information on the gravimetric method of prospection and the mathematical theory, and includes a description of Eötvös torsion balance. Operations in the field and interpretation of data are discussed briefly. The author concludes that the degree of success attained by this method will depend on (1) the accuracy and thoroughness of the field survey and (2) the skill and experience applied to the interpretation of results.— W. Ayvazoglou.

2. MAGNETIC METHODS

MAGNETOMETER STUDY OF THE CADDO-SHREVEPORT UPLIFT, LOUISIANA

By William M. Barret

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 2, 1930, pp. 175-185.

Major disturbances of the vertical magnetic field are associated with the Caddo-Shreveport uplift. The writer presents the relationship between geologic structure and the vertical element. The possibility that well casing and tubing introduce a distortion of the lines of force delineating the field is considered, and the similarity of vertical intensity and gravity gradient profiles is suggested. The writer offers several hypotheses to account for the areal pattern of the resultant anomalies.— Author's abstract.

ON THE WORK OF THE MAGNETOMETRIC PARTY IN THE REGION OF KRIVOY ROG (In Russian)

By A. Strona

Vestnik du Comité Géologique, vol. 4, No. 10, Leningrad, pp. 20-23.

The discovery of the anomalous zone of Krivoy Rog-Jeltiansk, in 1928, initated the sending of a party to investigate the extension of this zone into the district of Kremenchug. It was established that the anomaly continues without interruption and has a mean value of intensity V_a (vertical component) of about 0.1 c.g.s., reaching sometimes a value of 0.27 c.g.s. The party established that the main anomaly in the district of Kremenchug was unquestionably caused by thick layers of iron deposits; the percentage of Fe in these deposits is to be determined. As there were no geological data pertaining to the region, the magnetic investigations were carried out entirely independent of them.

Another interesting magnetic anomaly was found to the south of the Kremenchug-Poltava railroad line; in this region the intensity V_a reached in some places the extraordinarily high value oqual to 0.567 c.g.s. Tiberg-Thalen's magnetometer was used. An apparatus constructed by Pavlinoff and manufactured in the workshops of the Government Optical Institute was tried also, but proved to be inferior to the Tiberg-Thalen magnetometer, as, in addition to its much higher price ($700), it was only one-fifth as efficient. — W. Ayvazoglou.

UEBER DEN NACHWEIS VON ANTIKLINALEN UND SYNKLINALEN DURCH ERDMAGNETISCHE MESSUNGEN

(ON THE DETERMINATION OF ANTICLINES AND SYNCLINES BY MEANS OF ELECTRO-MAGNETIC MEASUREMENTS)

By J. B. Ostermeier

Petroleum, vol. 26, No. 10, 1930, pp. 325-326.

Based on an example given in J. G. Sineriz's article "Los Methodos geofisicos de Prospeccion" (Madrid, 1928, pp. 474-476, Lamina XV), Ostermeier calculates the maximum anomalies of the earthmagnetic vertical intensity which can be expected over synclines and anticlines if the same difference of susceptibility as is mentioned in the example is assumed. The author concludes that the accuracy of earthmagnetic measurements of synclines and anticlines increases with the depth of the primitive rocks.—W. Ayvazoglou.

PROFILAUFNAHMEN AN EINER ERDMAGNETISCHEN STÖRUNG IN OSTPREUSSEN

(MAPPING OF PROFILES OF AN EARTHMAGNETIC DISTURBANCE IN EAST PRUSSIA)

By F. Errulat

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, pp. 53-58.

Measurements of magnetic disturbance in the region southwest of Pillkallen were carried out by the author. Schultze's magnetometer No. 18, improved by the addition of some parts from No. 19, was used.

Tables showing (1) the position of the 17 stations, (2) the results of the observations, and (3) the values of disturbances, are given. Diagrams of profiles between stations 1 and 9 and 1 and 14, are drawn. The position of the stations and the horizontal vectors of disturbance are represented in a figure.—W. Ayvazoglou.

SULLA CORREZIONE TOPOGRAFICO-MAGNETICA

(ON MAGNETIC CORRECTIONS FOR TOPOGRAPHY)

By Arnaldo Belluigi

Atti della Pontificia Accademia delle Scienze Nuovi Lincei, Vol. 82, Session 6, March, 19, 1929, 10 pp.

The author discusses the problem of topographic corrections by applying magnetic measurements in a region with rough topography. The article deals with theoretical conditions as well as with the practical application of the method in the hilly region of Parma.. Schmidt's magnetic variometer has been used.—W. Ayvazoglou.

3. SEISMIC METHODS

DIE ERSTEN DICKENMESSUNGEN DES GRONLANDISCHEN INLANDEISES

(THE FIRST MEASUREMENTS OF THE THICKNESS OF GREENLAND'S INLAND ICE)

By Ernst Sorge

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 22-31.

Sorge gives the results of a German expedition to Greenland, undertaken in August, 1929, with the purpose of making measurements of the thickness of the inland ice. The seismic method was employed, and Wiechert's vertical field seismograph was used.

Four stations were selected, and the results of 22 explosions were registered. The thickness of ice was established by the reflection of longitudinal waves from the lower limiting surface of the ice.

A table shows the data obtained. The thickness established varies from 330 meters at 970 meters above sea level, to 1,200 meters at 1,570 meters above sea level. Seismograms and diagrams of longitudinal and transversal waves are added.—W. Ayvazoglou.

WAVE-FRONT DIAGRAMS IN SEISMIC INTERPRETATION

By H. R. Thornburgh

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 2, 1930, pp. 185-201.

Subsurface structure can be established from seismic data by graphical methods based upon wave-front diagrams. The method of construction of these diagrams is shown, and the nature and origin of the important under-layer wave is explained. Coincident time-curves and secondary shotpoints are defined and some applications are illustrated. The diagrams are used to explain some of the simpler seismic rules, and the original determination of simple under-layer structure is illustrated.

The paper is only an introduction to wave-front methods; the principles developed can be applied by experienced seismologists to more complex situations. — Author's abstract.

DIE SEISMISCHE BODENUNRUTE IN HAMBURG UND IHR ZUSAMMENHANG MIT DER BRANDUNG

(THE SEISMIC DISTURBANCE OF THE GROUND IN HAMBURG AND ITS CONNECTION WITH THE SURF)

By H. Mendel

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 32-41.

This detailed abstract was made by H. Schünemann from H. Mendel's work (47 pp. 6 figs. 12 tables, Hamburg, 1929) bearing the same title. Schünemann examines the microseismic disturbance of the first order occurring in Hamburg, by means of voluminous material, concerning the amplitudes and periods, as well as the possible connection of these two quantities, and especially concerning the influence of the surf movements on the Norwegian coast and in the Bay of Biscay. The data obtained by Wiechert's horizontal seismograph ($V =$ about 200, $T_0 =$ about 10 sec.) in the years from 1909 to 1913 and from April 1, 1919, to March 31, 1924, served as a basis for the determination of the horizontal component of the movement; for the vertical component the records of Wiechert's vertical seismographs ($V =$ about 200, $T_0 =$ about from 4 to 6 sec.) for the last mentioned period were used. Maximum amplitudes and corresponding periods were measured every day between 6-50 and 7-10 of mean Greenwich time; the mean values of these data, divided into three components of the movement as well as into horizontal and vertical components, are grouped according to the years, months, and decades.— H.Schünemann's abstract translated by W. Ayvazoglou.

ZUR FRAGE DER LAUFZEITKURVEN

(CONCERNING THE QUESTION OF THE TIME-CURVES)

By B. Gutenberg

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 57-64

In connection with Krumbach's article, "Zur Frage der Laufzeitkurven", published in Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 303-314 (see Geophysical Abstracts 10), Gutenberg discusses the original sources of error in establishing new time-curves, as well as the indications for the difference of time necessary for traveling of longitudinal waves during the different earthquakes.

In two brief articles, that of Krumbach, entitled "Erwiderung zur vorstehenden Arbeit von Herrn Prof. Gutenberg" (Answer to Professor Gutenberg's Preceding Article), pp. 60-62, and that of Gutenberg, "Bemerkungen zu der vorstehenden Erwiderung" (Remarks on the Previous Answer), pp. 62-64, the authors express their viewpoints on the question.—W. Ayvazoglou.

THE EFFECT OF SUPERFICIAL SEDIMENTARY LAYERS UPON THE TRANSMISSION OF SEISMIC WAVES

By A. Imamura, F. Kishinouye, and T. Kodaira

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 471-489.

In this article the authors discuss the results of introducing into their studies of seismometry the conception of a surface layer overlying the granitic one. Twenty-one shocks, which originated within the network of stations under the observation of the authors, out of 65 which shook the Kwanto district during 1927, were examined. The authors started their calculations by assuming the existence of the substrata in this region as established by Proffessor Matuzawa (granitic layer — depth of the lower boundary = 20 km., the basic layer — depth of the lower boundary = 50 km., and the ultra-basic layer), and worked on the evaluation of the thickness and of the value of K ($K = \frac{d}{t}$ in which "d" is the distance of the seismic focus from a station and "t" the duration of the preliminary tremors at the said station) of the surface layer conforming to the results of observations of these 21 shocks. The results of observations are given in tables and diagrams.- W. Ayvazoglou.

ON THE EARTH VIBRATIONS INDUCED IN SOME LOCALITIES AT THE ARRIVAL OF SEISMIC WAVES

By A. Imamura

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 489-495.

Seismograms may involve, besides seismic waves propagated from the focus to our stations, earth vibrations induced there by means of the seismic waves thus arrived. The present article contains some results of analytical study of such earth vibrations.

A figure shows seismograms due to the earthquake of November 6, 1925, near Kasumigaura, which were registered at diluvial ground in Tokyo with an Imamura tronometer ($V = 50$, $T_0 = 7$ sec.) and with another similar instrument set up on a rigid pedestal of 16.1 by 11.6 by 4.3 foot size. The pedestal was situated about 210 meters from the first station, with its upper level lower than the ground level by 4.9 meters. The difference of the earth movements indicated by the seismograms obtained at these two stations revealed that small earth vibrations of a period ranging from 0.2 to 0.4 sec. were induced in the thin surface layer of the place.

Another illustration reproduces the seismograms due to the deep-seated earthquake (depth about 300 km.) which occurred on June 3, 1929, at 6.34 a.m. off the coast of Sima province. It was registered with instruments, essentially of the same type as those previously mentioned, installed at Siotu and Hikata in Kii province, the mutual distance between the two stations being only 4 kilometers. The ground of Siotu is Paleozoic diabase tuff in formation, whereas that of Kitaka is of the same formation covered with soil of certain depth. It will be noticed that the P-phase is much larger than the S-phase, a characteristic perculiar to earthquakes at such a depth. The duration of the P-phase at both stations was 39.5 seconds.

A specially interesting fact noted in observing such an earthquake at a distance, as in the present case, is that the seismic waves omerge almost at right angles to the earth's surface, and consist for the most part of slow undulations almost free from vibrations of short duration. In fact, the seismograms of both stations are similar to each other, except that the Hikata register involves in addition a series of secondary vibrations of a constant period of about 0.55 seconds These secondary vibrations are present only in the P-phase, and are approximately proportional to the magnitude of the fundamental waves accompanying them. This wou suggest that they are earth movements induced in the supcficial soil layer, possibl as plane elastic waves making reflection at the upper and lower boundaries of the layer.

Examination of seismograms obtained during the same earthquake and obtained at our seismological stations in the Kwanto district has brought out, as the periods of similarly induced earth-vibrations, the following values:

For superficial soil layer - - - - - - 0.2 — 0.3 sec.
For diluvium soil layer - - - - - - - 0.4 — 0.5 sec.
For Tertiary soil layer - - - - - - - 0.6 — 0.7 sec.

If such a method of estimation be legitimate, then the thickness of the different layers may be worked out. — Author's abstract.

REGISTRIERUNGEN MIT ZWEI GALITZINPENDELN VERSCHIEDENER PERIODE

(REGISTRATIONS MADE WITH TWO GALITZIN-PENDULUMS WITH DIFFERENT PERIODS)

By B. Gutenberg

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 74-80.

Records of a Galitzin-pendulum with short period installed on the Taunns observatory started a series of questions, the answering of which was possible only by comparison with the records of a similar pendulum with greater period. Therefore, two Galitzin-pendulums with own periods of 2.7 seconds and 19 seconds respectively, were set up on the same pillar. The results obtained are discussed and illustrated by graphs represented on the same sheets. The results may be summed up as follows:

1. The records of the pendulums were so much different that only in very rare cases was it possible to establish that the same components at the same time were involved.

2. The short-period pendulum showed a better picture of an earthquake originating at a short distance than the long-period pendulum.

3. In case of remote earthquakes mostly only the direct longitudinal waves were recorded by the short-period pendulum.

4. The short-period pendulum sometimes recorded the longitudinal waves more quickly than the long-period pendulum.

The author concludes that an investigation of the records obtained by pendulums with different periods, owing to the great differences obtained by the periods used, is desirable. He finds the Galitzin-pendulum suitable for this purpose. — W. Ayvazoglou.

UEBER DIE AUSLÖSUNG VON ERDBEBEN DURCH DIE ACHSENSCHWANKUNGEN DER ERDE

(ON THE ORIGIN OF EARTHQUAKES BY OSCILLATIONS OF THE AXES OF THE EARTH)

By R. Spitaler

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 118-129.

Based on observations made of 87 earthquakes, the author shows that a close connection exists between the latitude of a place on the globe and the respective changes which take place in it at the time of the earthquake. The earthquake is generally preceded by a change of direction of the elastic tension of forces caused by the change of latitude with the tendency to forming the rotation-ellipsoid in conformity with the new position of the rotation axis, temporarily producing earthquakes in certain places adapted to them.— Author's abstract.

LE ONDE MISTE E L'OTTICA DEI RAGGI SISMICI

(COMBINED WAVES AND OPTICS OF SEISMIC RAYS)

By Arnaldo Belluigi

Gerlands Beiträge zur Geophysik, vol. 23, No. 3, 1929, pp. 233-236.

The author generalizes some results obtained by P. Rudzki which concern the existence of combined waves in anisotropic mediums. It seems necessary to take into consideration in the theory of seismic rays not only the well-known P and S waves, but also the P_m and S_m waves ("m" stands for "misto," combined) in order to bring certain mathematical demands into accord with corresponding experimental demands.— Author's abstract translated by W. Ayvazoglou.

RESULTATS DES OBSERVATIONS SEISMIQUES ON TCHECOSLOVAQUIE

(RESULTS OF SEISMIC OBSERVATIONS IN CZECHOSLOVAKIA)

By Jos. Plihal

Institut Geophysique National Tchecoslovaque, Bulletin Sismique, vol. 1, 1928, pp. 1-26.

The seismologic, as well as the magnetic service, in Czechoslovakia are at the present time concentrated in the "National Geophysical Institute of Czechoslovakia." In this article Plihal gives a description of several seismic stations established in this country, their equipment and the results of observations up to the year of 1928. A map showing the situation of seismic stations is added.— W. Ayvazoglou.

4. ELECTRICAL METHODS

PROSPECTIEREN AUF ÖL MIT ELEKTRISCHEN METHODEN

(PROSPECTING FOR OIL BY ELECTRICAL METHODS)

By Karl Sundberg

Petroleum, vol. 26, No. 10, 1930, pp. 317-324.

Before giving the results of practical work carried out by the author in the field, Sundberg discusses the different lines of direction which can be pursued in searching for oil by electrical methods of prospecting:

1. Locating of important structures, such as anticlines and synclines, based on their good or bad electric conductivity in comparison with the surrounding areas. A brief discussion of the applicability of this kind of investigation is given.

2. Searching for oil by electrical methods based upon the assumption that a direct finding of oil is possible owing to its nonconductivity. Practical application of this case is difficult and can be realized under especially favorable conditions only.

3. Application of electrical methods of prospecting for oil consisting of the investigation of the configuration of the conducting subterranean strata.

The third way of searching for oil is examined in this article. As this method is based on the differences in the electric conductivity of various sedimentary layers, the author examines the factors by which the conductivity is determined (sufficiently great difference in the electric conductivity of single layers, direction of layers of good conductivity with regard to the geological structure in general, percentage of water in rocks, specific resistance of water in the pores). A table showing the volume of pores of various rocks in percentage and a table of specific resistances of rocks (in ohms per cubic centimeter) in case the pores are filled with surface or ground water or with salt water are given.

The second part of the article deals with the description of the principles of the electrical method, the work in the field and practical results.

Although most of the details of investigations carried out by Sundberg up to 1929 (about 2,500 sq. km.) could not be disclosed owing to special agreements made with the companies for which the author worked, the results of electrical prospecting for oil in the region of Lanzendorf, near Vienna, are given in this article. A good conformity of geologic and geoelectric surveys was obtained and even more details were disclosed by the latter. A map of Lanzendorf showing the results of both the investigations is added.--W. Ayvazoglou.

7669

AMPLIFICATORI GEOMETRICI DI PICCOLO DEFORMAZIONI DI LINEE DI CORRENTE IN UNO SUOLO ARTIFICIALMENTE ELETTRIZZATO

(GEOMETRICAL AMPLIFICATION OF SMALL DEFORMATIONS OF CURRENT LINES IN AN ARTIFICIALLY ELECTRIFIED GROUND)

By Arnaldo Belluigi

1929, 4 pp.

In this article Belluigi explains the theory and derives formulas for a geometrical "amplifier" by which small deformations of the current lines in an artificially electrified ground can be discovered. He comes to the conclusion that these lines may serve with great advantage for the interpretation of geoelectrical data.--W. Ayvazoglou.

PRACTICAL RESULTS OF ELECTRICAL PROSPECTING AT ABANA

By John B. DeMille

Canadian Mining Journal, vol. 51, No. 14, 1930, pp. 314-316

The basis of this discussion is an electrical survey involving three days of field work during the month of July, 1927, on the property of Abana Mines, (Ltd.), northwestern Quebec. The purpose in reviewing at this time the geophysical data secured in 1927, is to check against the important underground development which has taken place subsequently.

After the description of the development of the work in the mines during the recent years the author draws the following conclusions:

1."The abana electrical indication represented the mineralized outcrop as being the surface showing of a zone of strong metallic deposition continuing both east and west from the known point.

2."The electrical axis indicated an error of S. 20º E. in the assumed strike of the zone of mineralization east of the shaft.

3."The persistence and uniform strength of the conductor indicated the ore as occurring in a continuous vein rather than as a lense represented at the surface by an isolated outcrop.

4."The increase in depth of the electrical axis east of the shaft has been found by subsequent development to correspond roughly with the contour of the east end of the main ore zone, ore in the 100-foot level being located approximately over the center of the orebody on the 550 level. While there is no apparent rake or pitch to the east, this upward tapering of the mineralized zone is an interesting detail to compare with the steep pitch of the electrical axis."

Based on the results obtained, the author's opinion is that the use of electrical prospecting for solving definite problems is justified, as the accuracy of the possibilities indicated by electrical prospecting was to a large extent proved by the underground development. The work outlined for the survey was also simplified.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

DER GEHALT DER FREILUFT AN RADIUMEMANATION UND DEREN VERTEILUNG IN DER NÄHE DES ERDBODENS NACH BEOBACHTUNGEN IN GRAZ IN JAHRE 1928

(CONTENT OF RADIUM EMANATION IN FREE AIR AND ITS VERTICAL DISTRIBUTION NEAR THE SURFACE OF THE EARTH ACCORDING TO OBSERVATION MADE IN GRAZ IN 1928)

By Walter Kosmath

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 95-113.

The author shows that the cocoanut-charcoal proceeding is suitable for the quantitative measurement of the content of radium emanation in the free air and of the change of the content with respect to the height above the ground.

Wilhelm Schmidt's theory on the RaEm distribution in free air could not be proved by experiments. However, this fact can not be taken as a final decision, as the free-air investigations described were not carried on over a free field, while Wilhelm Schmidt's theory is strictly valid only for vertical distribution of RaEm over a free field.

The mean RaEm content of r_u (10 cm. above the ground) is equal to 173 times 10^{-18} Curie per cubic centimeter, the maximum value of r_u being 335 times 10^{-18} Curie per cubic centimeter and the minimum r_u 81 times 10^{-18} Curie per cubic centimeter. The ratio of the smallest concentration value of r_u to the highest concentration value of r_u is equal to 1 : 4.

The mean concentration value r_o (11.5 m. above the ground) is equal to 142 times 10^{-18} Curie per cubic centimeter, the maximum value of r_o 270 times 10^{-18} Curie per cubic centimeter, and the minimum value of r_o 43 times 10^{-18} Curie per cubic centimeter. The ratio of the minimum value of r_o to the maximum value of r_o is equal to about one to six.

The mean concentration ratio of r_o to r_u is 82 per cent, the minimum value being 51 per cent and the maximum 127 per cent. The dependence of the content and of the drop of RaEm in the free air in Graz on meteorological factors (pressure, drop of pressure, teperature, wind, cloudiness, humidity of the soil) was established. There is the folllwing relation between the RaEm content and the above-mentioned meteorological factors: in case of a higher pressure and increasing temperature the content of RaEm increases; it decreases in case of a negative drop of pressure (increasing air pressure) with the value of $\frac{dp}{dT}$ increasing, as well as in the case of the increasing humidity of the soil. With increasing strength of wind the content of RaEm near the surface of the ground decreases.

Cloudiness and the relative humidity do not affect, it seems, the content of RaEm. The concentration ratio $\frac{r_o}{r_u}$ of RaEm, with respect to the vertical drop of RaEm, is dependent on the above-mentioned meteorological factors because of the fact that with a positive and increasing value of the drop of pressure $\frac{dp}{dT}$, the ratio $\frac{r_o}{r_u}$ decreases and increases in case of negative and increasing value of the drop of pressure; it increases also with the increasing strength of the wind; the ratio $\frac{r_o}{r_u}$ decreases in case of a higher air pressure and increasing humidity of the ground. The ratio $\frac{r_o}{r_u}$ is not essentially affected by temperature and relative humidity.

The author also established that the very weak standard radium solutions (7.75×10^{-11} gr. Ra), received from the Physikalisch-Technischen Reichsanstalt in Berlin, were very stable.

In the supplement to this article the author describes the investigations of the RaEm conditions of the air in a cellar; a daily movement of the RaEm content was recorded, and it was established that the RaEm does not proceed entirely parallel with the conductivity of the air in the cellar. The mean RaEm value of the air in the cellar was equal to 100 times 10^{-16} Curie per cubic centimeter, the smallest concentration value equal to 39 times 10^{-16} Curie per cubic Centimeter, and the highest 150 times 10^{-16} Curie per cubic centimeter. The mean daily deviation is 22 per cent of the day value.

The RaEm content of the air in the cellar varied in a ratio of one to four. The dependence of the emanation content in the air of the cellar on the temperature was established; the RaEm content increased with the increase of the temperature.

The RaEm content of the air in the ground was examined also; its mean value at a depth of 75 centimeters has been found to be equal to 852 times 10^{-16} Curie per cubic centimeter.--Author's abstract translated by W. Ayvazoglou.

6. GEOTHERMAL METHODS

NOTE ON TEMPERATURE GRADIENTS IN THE PERMIAN BASIN

By Walter B. Lang

Journal of the Washington Academy of Sciences,
vol. 20, No. 7, 1930, pp. 121-123.

Lang discusses the temperature tests made in one of the wells in New Mexico (Transcontinental-McWhorten No. 1, Sec. 6, T.3 S., R. 22 E., De Baca County) and notes the influence of halite and anhydrite sediments, which are characteristic for this region, on the temperature gradients.

The varying behavior of the isogeotherms of any region can be explained upon differential rock conductivities. Owing to the fact that critical data of the sort necessary to determine the influence of rock conductivities in general upon temperature gradients do not exist, the author proposes that, in order to solve the geothermal problem, as many data as possible on the thermal conductivity of rocks as they exist under natural conditions be collected. --W. Ayvazoglou.

7. UNCLASSIFIED METHODS

GEOPHYSICAL PROSPECTING FOR OIL

By Donald C. Barton

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 2, 1930, pp. 201-227.

Geophysical prospecting for petroleum strictly is an indirect method of mapping geologic structure. In it, three successive steps can be recognized in all of the methods: (1) The mapping of the areal variation of some physical effect at the surface; (2) the determination of the subsurface distribution of some physical property producing the surface effect; and (3) the interpretation of the geologic situation corresponding with the distribution of that physical property. The methods have their limitations through the incomplete concordance between structure and the distribution of those physical properties, lack of knowledge of the geophysical constants of formations, inexperience, and erroneous geologic information. There is a bare possibility of the direct determination of the presence of petroleum by the electric method. Although the positive value of geophysical methods has been demonstrated, they are no panacea for all the difficulties in prospecting for oil. --Author's abstract.

ÜBER DEN ZUSAMMENHANG ZWISCHEN TÄGLICHEM TEMPERATURGANG UND STRAHLUNGSHAUSHALT

(THE RELATION BETWEEN THE DAILY VARIATIONS OF TEMPERATURE AND BALANCE OF RADIATION)

By Fritz Albrecht

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 1-35.

The registration of temperature in bright summer days in Lapland and at Potsdam showed a tripartite division of the daily variations of temperature of the air at a height of 1 or 2 meters.

According to registrations of temperature at different heights above the surface of the earth, this tripartite division might be explained as a formation of a ground inversion at night, as its removal in the morning, and as carrying away by convection at noon and in the afternoon.

The single components which have a share in the exchange of the heat on the surface of the earth were contemplated. In reference to the efflux of the heat of the earth to the air, this contemplation resulted in an extension of Wilhelm Schmidt's "Austausch" (exchange) theory by using the laws of the loss of the heat of hot bodies for the limit sphere of the earth and the air.

The influx of the heat of the air to the surface of the earth could be considered with regard to Angström's former examinations and had been compared with the circumstances of temperature above the place of observation.

Considering already known relations, the heat of radiation on the surface of the earth and from the variations of temperature in the earth, the heat exchanged in the earth could also be calculated.

The quantity of evaporation now appeared as a remainder of the balance of the heat on the surface of the earth which was known in all other components by the other data. In order to check them, a formula for the evaporation was derived for the surface of the sand field upon which these observations were made. This formula had been compared with the calculated values.

The examinations resulted in the development of a formula by which the observed variations of temperature were connected with the data of the balance of the heat on the surface of the earth. According to this formula the exchange of the heat was calculated on four radiation-days belonging to the four different seasons.—Author's abstract.

COMPARATIVE ADVANTAGES OF APPLYING SEVERAL GEOPHYSICAL METHODS OF PROSPECTING TO THE SAME TERRITORY

By F. W. Lee

Information Circular 6235, Bureau of Mines, February, 1930, 11 pp., 22 figs.

Taking into consideration that all geophysical prospecting methods have certain inherent restrictions depending upon many diverse factors, the author discusses in this paper some of these restrictions, pointing out how they exhibit themselves and how further light may be shed upon them.

Two typical examples of work in the field are given.

The examples are taken from explorations in the well-known Sudbury Basin on the Falconbridge and Errington properties.

After a brief description of the structure of both the properties, which are thoroughly examined by diamond drilling and mine exploration, the author examines the factors that determine the choice of methods in the corresponding area (magnetic survey, self-potential survey, electrical resistivity survey) and gives the results obtained from these three different methods. Based on these results Lee compares their suitableness for each area investigated. The results of the surveys are illustrated by 25 figures.

The article is supplemented by a description of mines and discussion of geological features of the Sudbury Basin made by J. B. Mawdsley. The description is limited to the Falconbridge and Errington areas where geophysical studies were made. — W. Ayvazoglou.

LES PROSPECTIONS GEOPHYSIQUES DE CARIBOU (COLORADO)

(GEOPHYSICAL INVESTIGATIONS AT CARIBOU, COLORADO)

By Ch. Finaton

La Revue Pétrolifiere, Nos. 357 and 360, 1930, pp. 161-164 and 273-278.

This is a detailed abstract of Technical Paper 439, "Geophysical Investigations of the U. S. Bureau of Mines at Caribou, Colo., "by C. A. Heiland, Chas. W. Henderson, and J. A. Malkovsky. (See Geophysical Abstracts No. 9).— W. Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN NUMBERS THREE AND FOUR OF THE "BOLETIN DE LA ASOCIACION GEOFISICA DE MEXICO."

Vol. 1, Nos. 3 and 4, September and October, 1929, pp. 56-66 and 70-84.

The following articles on geophysical prospecting appeared in numbers 3 and 4 of the "Boletin":

1. Measurement of the content of radium emanations in the atmospheric air (Medicion de las emanaciones radioactivas contenidas en el aire atmosferico), by A. A. Lomakin. This is a translation into Spanish by Prof. Juan Korzujin of the Russian article which appeared in Bull. Inst. Pract. Geophysics No. 3, Leningrad, 1927 (See Geophysical Abstracts No. 2).

2. Application of geophysical methods of prospecting in practice (El empleo de metódos geofisicos en la practice), by Eng. Kurt Ritzau (See Geophysical Abstracts No. 8). Continuation of the article published in No. 2 of the same "Boletin," translated into Spanish by E. J. Helbling Ziehl. Gravitational, magnetic, and electrical methods of prospecting are discussed. The article is to be continued.

3. Physical principles of the gravimetric method of prospecting (Bases fisicas del metodo gravimetrico), by P. Nikiforov. This is a continuation of the article translated from Russian into Spanish by Prof. Juan Korzujin (See Geophysical Abstracts No. 8).

4. Radiometric exploration of oil deposits (Exploracion radiometrica del petroleo), by L. N. Bogoyavlensky. A translation into Spanish of the Russian article published in Bull. Inst. Pract. Geophys. No. 3, Leningrad, 1927, pp. 113-124 (Geophysical Abstracts No. 2). — W. Ayvazoglou.

ZUR DYNAMIK DER ATMOSPHARISCHEN DRUCKSCHWANKUNGEN

(DYNAMICS OF THE ATMOSPHERIC VARIATIONS OF PRESSURE)

By H. Ertel

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 59-73.

A pressure variation at an altitude H may be regarded as the result of two partial variations. The first change results from the mass variation over H. This mass variation, which is the cause of the pressure variation, may be called the "direct introduction of mass." Direct introduction of mass is the cause of the disturbances of the vertical pressure distribution. The compensation of these disturbances by vertical movements causes a second pressure variation called the "compensatory pressure variation." The effect of the two pressure changes is the measurable local pressure variation, which, of course, does not permit the drawing of any conclusions with regard to the direct introduction of mass. In this publication the author shows that the latter has a much greater significance for the comprehension of the atmospheric pressure variations than the measurable local pressure variation.

The calculation of the direct introduction of mass, made on the assumption that the disturbances caused by the direct introduction of mass compensate themselves through adiabatic vertical motions, gives the following result: The direct introduction of mass has a first maximum in the lower troposphere and a second maximum in the stratosphere, while the introduction of mass is slow in the middle of the troposphere. This result is the verification of the ideas of von Flicker on the mechanics of the atmospheric pressure variations.— Author's abstract.

ZUR BESTIMMUNG DER ERDGESTALT NACH ISOSTATISCHEN GESICHTSPUNKTEN

(CONCERNING THE DEFINITION OF THE FIGURE OF THE EARTH FROM THE VIEWPOINT OF ISOSTASY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 81-84.

In an essay published by Astronomische Nachrichten (vol. 237, No. 5669, 1929), W. Heiskanen defines his position with regard to Hopfner's publications concerning the definition of the figure of the earth. In this article Hopfner onc more gives a clear definition of his views in the problem of the figure of the earth and points to the errors committed by Heiskanen in his replication. — Author's abstract.

POSSIBILITA PRATICHE DI RICERCHE GEOGISICHE

(POSSIBILITIES OF GEOPHYSICAL PROSPECTING IN PRACTICE)

By Arnaldo Belluigi

L'Industria Mineraria, vol. 3, No. 9, 1929, pp. 1-10.

General discussion of gravimetric, seismic, magnetic, and electric measurements is given. — W. Ayvazoglou.

INTRODUZIONE ALLA GEOFISICA MINERARIA

(INTRODUCTION TO GEOPHYSICS IN MINES)

By A. Belluigi

Issued by L'Industria Mineraria, 1929, 88 pp.

The phamphlet deals with megnetic, seismic, geothermal, and electrical methods of prospecting.

Contents of the book:

1. General conceptions on the magnetism of minerals.
2. Magnetism of minerals.
3. Magnetic variometers.
4. Seismic method and its application.
5. Geothermal method of prospecting for oil.
6. Electrical method of prospecting for oil.
7. Present conditions of the electrical method of prospecting.

Photographs and diagrams illustrate the book. —W. Ayvazoglou.

GEOPHYSICS RESPONSIBLE FOR 14 NEW FIELDS IN GULF COAST

By Jack Logan

The Oil Weekly, vol. 56, No. 7, 1930, pp. 145-146 and 212-218.

In this article Logan gives a brief history of 14 new oil fields discovered by geophysical methods of prospecting during 1929. Six of them are located on the Texas Gulf coast and eight in Louisiana. Two fields in Texas were discovered by the torsion balance and the others were found by the seismograph.

Aside from developing production on the 14 oil fields metioned above, salt domes and favorable looking structures were discovered during 1929 in at least 40 new prospective oil fields — 22 in Texas and 18 in Louisiana.

Those 40 geophysical prospects are listed in an accompanying table, showing the location of each, the company and method by which it was discovered, and the development that has been done, if any. — W. Ayvazoglou.

THE GEOPHYSICITS IN SESSION

Editorial note

Mining and Metallurgy, vol. 11, No. 279, 1930, pp. 176-178.

The following summary of the topics discussed by the geophysicits during the 139th general meeting of the A.I.M.E., held in New York in February, 1930, is given below.

"The points of the meeting which stand out in the reporter's mind are concerned with the advances in technique and with the attempt to define the training which a geophysicist should receive. The argument about the relative value of high-frequency and low-frequency methods has been put on a rational basis by the work of the United States Bureau of Mines in conjunction with Dr. Eve. They have shown that high frequency waves do not penetrate as deeply as low frequency ones, and Dr. Sundberg has shown how to take advantage of this fact in making structural studies. The Messrs. Schlumberger have presented results of astonishingly deep penetration by means of direct current in potential methods.

"The general opinion in the matter of training geophysicits seems to be that a man should have a thorough basis of geology and that this basis should include the mathematical and physical sciences. The theory of geophysics he can get as an undergraduate, but the practical application should come as a postgraduate course. In order to interpret his results intelligently he must have a thorough geological knowledge of the problem being treated. Finally, an outstanding point is that mining men now admit geophysics has come to occupy a permanent place in geological work, and that it can serve useful purposes when intelligently applied. .

"After the session an open meeting of the Geophysics Committee was held at which the possibility was discussed of forming some sort of loose organization to correlate the geophysical interests of the members of various existing technical societies, without interfering with the latter in any way. By this means it would be hoped to avoid duplication of papers and efforts."—W. Ayvazoglou.

COURSES IN APPLIED GEOPHYSICS GIVEN AT THE COLORADO SCHOOL OF MINES

By C. H. C. Braden

The Colorado School of Mines Magazine, vol. 20, No. 4, 1930, pp. 23-24.

The author gives a short description of the Colorado School of Mines' courses in applied geophysics for the purpose of brining to the attention of those interested in geophysical prospecting the nature and extent of the training offere at this school. The equipment available at the school for instruction in geophysics and the text books used are mentioned. — W. Ayvazoglou.

9. NEW BOOKS

Berg, Georg, Prof. Dr., Vorkmmen und Geochemie der mineralischen Rohstoffe. Einführung in die Geochemie und Lagerstättenlehre (Existence and geochemistry of mineral raw materials. Introduction into Geochemistry and study of ore deposits). Besonders für Chemiker und Studierende der allgemeinen Naturwissenschaftern. 1930. X and 390 pages, 67 figures. Price: stitched R.M. 26; bound R.M. 28. Akademische Verlagsgesellschaft m.b.H. Leipzig.

Beyschlag, Franc. Geologic Map of the World. Berlin, W. 35, Schöneberger Ufer 12 a. Scale 1 : 15,000,000; in 12 sheets, each 25 by 31 inches. The geologic formations are shown in colors conforming to general usage with 21 divisions for sedimentary and 9 for igneous rocks. Ocean depths are shown by the 200-meter contour and the 1,000-meter contour and its multiples. The title and legend are in German, French, English, and Spanish. The first installment of four sheets, covering the northern part of the world, has been issued; the second and third installments are to be issued before the end of 1930. The map is to be sold only in complete sets of 12 sheets and legend, the subscription price being 150 gold marks (about $36).

Haalck, Hans, Dr., Die Gravimetrischen Verfahren der angewandten Geophysik (Gravimetric methods of applied geophysics). 1930. Paper cover, pp. VIII and 205 pp., 85 figs. Price, M. 16.80; Sammlung geophysikalischen Schriften herausgegeben von Prof. Dr. Carl Mainka. Verlag von Gebrüder Borntråger, Berlin.

Haalck, Hans, Dr., Die magnetischen Verfahren der angewandten Geophysik. (Magnetic methods of applied geophysics). 1930. Paper cover, VIII and 150 pp., 61 figs. and 3 tables. Price, M. 12. Sammlung geophysikalischen Schriften, herausgegeben von Prof. Dr. Carl Mainka. Verlag von Gebrüder Borntråger, Berlin.

Heine, Walther, Dr., Elektrische Bodenforschung, ihre physikalischen Grundlagen und ihre praktische Anwendung (Electrical Prospecting; Physical Foundation and practical application of it). 1928. Paper cover, VIII and 222, pp., 117 figs. Price, M. 18. Sammlung Geophysikalischen Schriften, herausgegeben von Prof. Dr. Carl Mainka. Verlag von Gebrüder Borntråger, Berlin.

Kähler, K., Prof. Dr., Einführung in die atmosphärische Elektrizitat. (Introduction in the atmospheric electricity). 1929. Paper cover, VIII and 244 pp., Price, M. 17 - 60. Sammlung geophysikalischen Schriften, herausgegeben von Prof. Dr. Carl Mainka, Verlag von Gebrüder Borntråger, Berlin.

Perrier, G. Travaux de la Section de geodosie de l' union geodesique et géophysique international. Tome 6. Rapports généraux établis a L'occasin de la 3-ième assemblée générale a Prague, 29 Aout - 10 Sept., 1927. (Transactions of the Section of Geodesy of the International Geodetic ahd Geophysical Union, vol. 6, General reports issued on occasion of the third general assembly at Prague, Aug.29 - Sept. 10, 1927). Published in 1929.

INDEX

PAGE

Abana, practical results of electrical prospecting at 14
Albrecht, Fritz 17
Anticlines and synclines, determination of them by means of electromagnetic measurements 7
Atmospheric variations of pressure, dynamics of 20

Barret, William M., ... 6
Barton, Donald C., ... 17
Belluigi, Arnaldo 4,5,7,12,14,21
"Boletin de la asociacion geofisica de Mexico," brief review of articles in Nos. 3 and 4 19
Braden, C. H. C. 22

Caribou, Colo., geophysical investigations at 19
Colorado School of Mines, courses of applied geophysics given at the. 22
Current lines in an artificially electrified ground, geometrical amplification of small deformations of them 14
Czechoslovakia, results of seismic observations in 12

DeMille, John B., ... 14

Earthquakes, on the origin of them owing to the oscillations of the axes of the earth 12
Earth-vibrations induced in some localities at the arrival of seismic waves 10
East-Prussia, mapping of profiles of an earth magnetic disturbance in 7
Editorial note 22
Errulat, F., ... 7
Ertel, H., ... 20

Figure of the earth, concerning its definition from the viewpoint of isostasy 20
Finaton, Ch., ... 19
Force of gravity, fundamental questions in computing the 4

Galitzin-pendulums with different periods, registrations made with two 11
Geophysical methods of prospecting to the same territory, comparative advantages of applying several 18
Geophysical prospecting, its possibilities in practice 21
Geophysicists in session 22
Geophysics in mines, introduction to 21
Gravimetrical proceedings for topographic corrections 5
Gravity measurements, a new four-pendulum apparatus for relative . . 2
Greenland's inland ice, the first measurements of thickness of . . . 8
Gulf coast, geophysics responsible for 14 new fields in 21
Gutenberg, B., ... 9,11

Page

Higashinaka, Hideo, ... 3
Hopfner, F., ... 4,21

Imamura, A., ... 9,10
Isogams, on the problem of 4

Jenne, W., ... 3

Kishinouye, F., ... 9
Kodaira, T., ... 9
Kosmath, Walter, ... 15
Krivoy Rog, on the work of the megnetometric party in the region of. 6

Lang, Walter B., ... 16
Lee, F. W., ... 18
Logan, Jack 21

Magnetometer study of the Caddo-Shreveport uplift, Louisiana 6
Matsuyama, Motonori, ... 3
Meissner, O., ... 2
Mendel, H., ... 8
Munich-Potsdam, their gravity difference 5

New Books 23

Oil, geophysical prospecting for, ... 17
Oil, prospecting by electrical methods 13
Ostermeier, J. B., ... 7

Plihal, Jos., ... 12

Radiation, the relation between the variations of temperature and the balance of 17
Radium emanation, its content in free air and its vertical distribution near the surface of the earth according to observations made in Graz in 1928 15
Rose, H. W., ... 5
Schmehl, H., ... 3
Schütte, Karl, ... 5
Seismic disturbance of the ground in Hamburg and its connection with the surf 8
Seismic rays, combined waves and optics of 12
Seismic waves, the effect of superficial sedimentary layers upon the transmission of 9
Sorge, Ernst, ... 8
Spitaler, R., ... 12
Strona, A., ... 6
Sundberg, Karl 13

Page

Takamachi oil field, subterranean structure revealed by gravitational method 3
Temperature constants and air-density constants of gravity pendulums, determination of them by the two-pendulum method 3
Temperature gradients in the Permian Basin, note on the, ... 16
Thornburgh, H. R., ... 8
Time-curves, concerning the question of the 9
Topography, magnetic measurements with respect to 7
Torsion balance, gravimetric method based on use of the 5

Underground geophysical measurements 2

Wave-front diagrams in seismic interpretation 8
Wolf, F., ... 2